REVIEW RESOURCES

Lesson 20: Acquisition Logistics: Fundamentals

Overview

Acquisition Logistics is a multi-functional technical management discipline associated with the design, development, testing, production, fielding, sustainment, and improvement/modification of cost-effective systems that achieve the user's peacetime and wartime readiness requirements.

To ensure that new systems are adequately supported, acquisition logisticians ensure that the system is designed for supportability, or consider supportability as a selection criteria for off-the-shelf purchases. They also design the support infrastructure, and make sure that all the necessary support structure is in place when the system is fielded.

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Supportability

Supportability is the degree to which system design characteristics and planned logistics resources meet system peacetime readiness and wartime utilization requirements.

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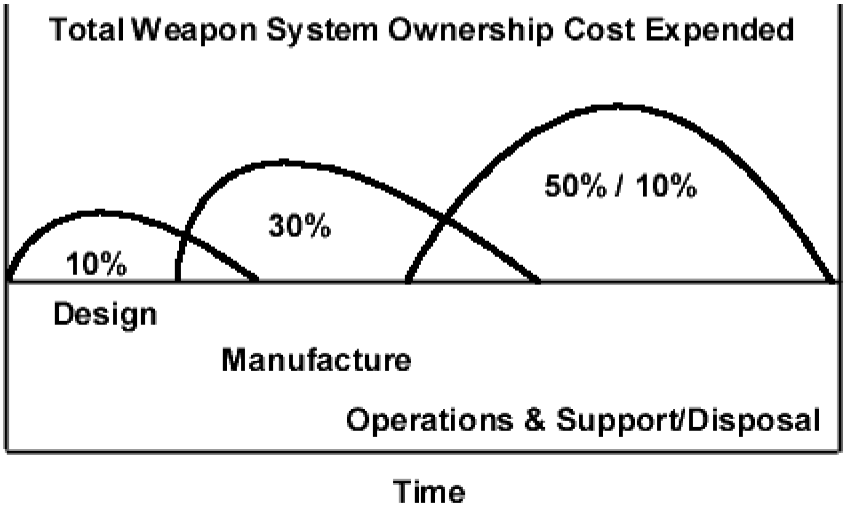
System Cost Over Time

As indicated in the chart below, more than 60 percent of the life cycle cost of a system occurs during the operations and support and disposal phases of the system life cycle. The decisions which have the most impact on the operations and support costs are made early during system design and development. Therefore, it is essential that supportability be a key element during these decisions.



LIFE CYCLE COST

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Minimizing Support Costs

Support costs can be reduced by using:

- Supportability considerations to address the upfront design process as a part of the overall Systems Engineering effort.
- Systems engineering practices to improve reliability, availability, and maintainability.
- Integrated Product and Process Development (IPPD).

Actions to reduce support costs should be taken early in the acquisition life cycle.

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Life Cycle Cost

Life cycle cost (LCC) includes the cost to develop, acquire, maintain, and dispose of a weapon system over its entire life. LCC includes system:

- Research, development, test, and evaluation
- Investment (procurement)
- Operations and Support
- Disposal

LCC also includes:

- Operators and maintenance personnel
- Spare parts
- Support equipment
- Facilities that will be needed for training, storage, and maintenance

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Supportability as a Key Factor

After requiring contract specifications to include reliability and maintainability requirements, the Navy's F/A-18 was **twice as reliable** as other Navy warplanes and required **less than half** the maintenance.

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Supportability Goals

The goal of supportability is to increase system capability while:

- Reducing ownership costs.
- Reducing dependence on spares.
- Requiring fewer support personnel.

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Reliability

Reliability is the probability that an item can perform its intended function for a specified interval under the stated conditions. ("How long will it work?")

Mean Time Between Failures (MTBF) is the average time interval between failures for repairable equipment.

One way to view system reliability is by calculating Mean Time Between Failures (MTBF). MTBF is the amount of time between one failure, its correction, and the onset of a second failure of the same component or subassembly--based on the entire population of equipment. MTBF is usually provided in units of operating hours or other measures, such as time, cycles, miles, or events.

For example, if a subsystem, such as a flight control subsystem, operates for 100,000 hours with one failure and there are 100 similarly reliable subsystems in use, the overall MTBF equals

$$\frac{100{,}000}{100}$$ or 1,000 hours.

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Maintainability

Maintainability is the measure of an item's ability to be retained in or restored to a specified condition when maintenance is performed by skilled personnel, using the correct procedures and resources. ("How long does it take to repair?")

Maintainability describes the ease, accuracy, and economy of performing a maintenance action. Maintainability results from system design, which should include (to the maximum extent possible):

- Accessible parts.
- Requirements for standard repair parts and tools.
- Interchangeable components.
- Throw-away replacement modules.

Mean Time to Repair (MTTR) is used to measure maintainability. MTTR is calculated as follows:

$$\text{MTTR} = \frac{\text{Total Elapsed Time}}{\text{Total Number of Corrective Maintenance Actions within a Given Time Period}}$$

For example, if the total elapsed time (in clock hours) for corrective maintenance is 1,200 hours and

there are 60 maintenance actions completed in that timeframe, then MTTR equals 1,200/60, or 20 hours.

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Availability

Reliability and maintainability combine to form the most common measure of system effectiveness—availability.

Availability is a measure of the degree to which an item is in the operable and commitable state at the start of a mission when the mission is called for at an unknown (random) time. ("How ready is the system to perform when needed?")

The mathematical equation that represents availability is:

$$\text{Availability} = \frac{\text{Up Time}}{\text{Up Time + Down Time}}$$

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Supportability Objectives

DOD pursues three supportability objectives:

- Ensure cost-effective support.
- Provide the necessary infrastructure.
- Meet readiness requirements.

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Reliability, Availability, and Maintainability and Supportability

Reliability, availability, and maintainability are aspects of supportability. Supportability is the ability of a system's design to meet an operational need:

- Throughout its intended life.
- At affordable costs.

Acquisition logisticians use Reliability and Maintainability (R&M) data to formulate system support requirements. Critical points to remember include:

- A system's R&M characteristics are key drivers of support resources.
- R&M does not drive all operations and support costs (e.g., fuel costs).

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Support Considerations

Support considerations during system acquisition are ultimately the responsibility of the PM and

involve:

- Developing support concepts.
- Providing support data.
- Acquiring support resources.
- Conducting supportability analyses as a part of the Systems Engineering Process.

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Supportability Analyses

Supportability analyses are conducted as part of the Systems Engineering Process. The goals of supportability analyses are to ensure that:

- Supportability is included as a system performance requirement.
- The system is concurrently developed or acquired with the optimal support system and infrastructure.

For example, all of the following can be categorized as supportability analyses:

- Repair level analysis
- Reliability predictions
- Reliability-centered maintenance (RCM) analysis
- Failure modes, effects, and criticality analysis (FMECA)
- Life cycle cost analysis

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Supportability Concepts

Supportability concepts, also known as maintenance concepts, include where and how a system will be maintained. Supportability concepts drive many of the other support considerations.

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Support Data

Support data include items such as user's manuals, tools lists, and provisioning requirements. Acquisition logisticians must ask:

- What format will they be in?
- What training documentation is needed?
- What media will be used?

Support data requirements shall be consistent with the planned support concept and represent the minimum essential to effectively support the fielded system.

Government requirements for contractor-developed support data shall be coordinated with the data requirements of other program functional specialities to minimize data redundancies and inconsistencies.

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Support Resources

Support resources include the funding necessary to design and purchase the support. Funding requirements must be identified early so that the support structure is in place when the new system is deployed.

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